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| **Lesson Title:** Ice Cream Lab |
| **Subject area / course / grade level:** 8th grade physical science |
| **Introduction:** This lesson can be used as an introduction into the states of matter or for chemical and physical reactions. It will probably work best if used as an extension or demonstration of the previously stated ideas, with the students already knowing about things like freezing point, etc. |
| **Lesson Length:** 45 minutes – 1 hour (depending on your time allocation) |
| **Materials:** For ice cream mixture:  1 Gallon-sized zip-lock bag (per student or group) Gallon of milk  1 Quart-sized zip-lock bag (per student or group) 1 can Eagle Brand sweetened condensed milk  Ice (lots of it!) Vanilla  Salt 1 cup of sugar  Cups (8oz is recommended but could be any size – 1 per student)  Spoons (at least 1 per student) |
| **Lesson Overview:**  Students will follow a procedure to make homemade ice cream and ask / answer questions about it. |
| **Tennessee Standards:**  SPI 0807.9.4 Differentiate between a mixture and a compound.  SPI 0807.9.6 Compare the particle arrangement and type of particle motion associated with different states of matter.  SPI 0807.9.8 Interpret the results of an investigation to determine whether a physical or chemical change has occurred. |
| **Lesson objective(s):**  To investigate the changes in states of matter with an activity making homemade ice cream. |
| **ENGAGEMENT**   * Engagement has 2 options: The first option is to open about ice cream and how it is made, having students describe it, share their favorite flavors, etc. Then lead them into the simple process for making our homemade ice cream. This option is better to let them see the ingredients and make the mixture together.   The second option is to lead them in with a mystery substance, having them focus on the states of matter themselves. Ask what would happen if we heat it, or cool it. Then tell them that we will do an experiment involving changes of state (and not tell them it is ice cream) With this one, it is probably best to have the ice cream mix already made.   * Students need to be focused on what would cause the changes in the states of matter and why they occur that way. If you want to tie mixtures into the lesson, they can see the changes that occur during the process, from the mixing stage all the way to the time they eat. |
| **EXPLORATION**   * Make the mixture first (this can be done in class or before – if you make it before then be sure to shake it up right before you distribute it to students)   Take one gallon of milk and pour off enough to add the rest of the ingredients. Add 1 can Eagle Brand  sweetened condensed milk, 1 cap full of vanilla, and 1 cup of sugar into the gallon jug with the remaining milk.     * Pour each student (or pair) an 8oz cup of **Ice Cream Mixture**. They should then pour this into their **Quart-Sized Zip Lock Bag**. They should add two 8oz cups of ice to the **Gallon-Sized Zip Lock Bag** as well as ~2-3 tablespoons of salt (I'm not really sure about this one, just a guess. It doesn't have to be a ton of salt). The students should then place the sealed **Quart-Sized Zip Lock Bag** containing the **Ice Cream Mixture** inside the **Gallon-Sized Zip Lock Bag**. Remind them to make sure the **Quart-Sized Zip Lock Bag** stays sealed, because salty ice cream is bad. * They then need to kneed/jostle around the bags constantly until the **Ice Cream Mixture** begins to freeze. It is important that the **Ice Cream Mixture**keeps moving as does the ice around the inner bag to ensure that the entire **Ice Cream Mixture** gets cold. It is also important to limit the amount time they touch the ice/mixture part of the bag. The heat from their hands will keep the ice cream from properly freezing. Constantly flipping the bag over while holding the seal portion of the outer bag is a good strategy. They just have to be careful to not accidentally let the inner bag open. |
| **EXPLANATION**   * Ask students what they witness. Why is it happening like that? What could make it different? Have students compare properties of the mix before the experiment and after. |
| **ELABORATION**   * Vocab: states of matter, solid, liquid, freezing point, mixture * Daily application is most evident in cooking, mixing things, and outdoor situations (like roads freezing) |
| **EVALUATION**   * Informal assessment throughout in the form of questions and discussion. They will need to identify their final form (some will like it completely frozen; others will want it more mushy.) This is also a chance to add in other states, not so much plasma, but a gel (liquid with solid particles stuck in it) |